KAJIAN CITRA PAN-SHARPENED PRISMA HYPERSPECTRAL UNTUK PEMETAAN KOMPOSISI SPESIES LAMUN DI SEBAGIAN KEPULAUAN KARIMUNJAWA

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INTISARI

Padang lamun memiliki peran multifungsi untuk ekosistem pesisir namun sayangnya saat ini mengalami degradasi. Pemetaan lamun, untuk mendukung program pengelolaan dan konservasi lamun, merupakan tugas yang menantang karena kemiripan respon spektral antar spesies lamun. Di Indonesia, padang lamun umumnya dihuni oleh berbagai spesies lamun yang menambah kompleksitas pemetaan. Tersedianya citra baru PRISMA *hyperspectral* (30m) dengan saluran pankromatiknya (5m) telah membuka peluang baru untuk pemetaan spesies lamun yang lebih efektif dan efisien dibandingkan dengan data hiperspektral *airborne*. Sehingga, diperlukan kajian mengenai citra *pan-sharpened* PRISMA *hyperspectral* untuk pemetaan komposisi spesies lamun di laut dangkal optis. Wilayah kajian penelitian ini adalah sebagian Kepulauan Karimunjawa. Citra yang digunakan yaitu PRISMA *hyperspectral* level 2C *at surface reflectance geocoded level.* Algoritma *Smoothing Filter-based Intensity Modulation* digunakna dalam *pan-sharpening* untuk mendapatkan citra hiperspektral dengan resolusi spasial 5m. *Linear Spectral Mixture Analysis* (LSMA) dijalankan untuk mendapatkan komposisi tutupan lamun dan objek bentik lain pada piksel citra *pan-sharpened* berdasarkan *endmember* enam spesies lamun tropis, substrat terbuka, dan makroalga. Klasifikasi *Random Forest* dilakukan dengan input citra *pan-sharpened* ter-*denoised* serta terkoreksi *sunglint* dan input citra fraksi kelimpahan hasil LSMA pada level spesies. Data tutupan spesies lamun di lapangan yang digunakan untuk uji akurasi diperoleh melalui teknik *photoquadrat* dan *phototransect.* Hasil penelitian ini menujukkan bahwa pemetaan spesies lamun menggunakan citra *pan-sharpened* PRISMA *hyperspectral* di padang lamun yang *patchy* dengan kerapatan rendah hingga sedang seperti di wilayah kajian tidak efektif, terlebih jika hanya menggunakan pendekatan berbasis spektra seperti LSMA karena kemiripan respon spektral antar spesies lamun. Meskipun begitu, hasil klasifikasi RF dengan input citra fraksi level spesies maupun citra *deglint* menunjukkan distribusi spasial yang sangat mirip, walaupun secara akurasi citra *deglint* memiliki performa yang lebih baik.

Kata kunci: PRISMA, Hyperspectral, *Pan-Sharpened*, Pemetaan, Spesies, Lamun, Uji Akurasi.

ACCURACY ASSESSMENT OF PAN-SHARPENED PRISMA HYPERSPECTRAL IMAGE FOR SEAGRASS SPECIES COMPOSITION MAPPING

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ABSTRACT

Seagrass meadows have multifunctional roles for coastal ecosystems but unfortunately currently experiencing degradation. Seagrass species mapping, which is needed to support management and convervation programs, is a challenging task due to the high similarity of reflectance spectra between healthy seagrass species. In Indonesia, a single seagrass meadow is commonly occupied by different seagrass species, which added the complexity of seagrass species mapping. The availability of a newly introduced PRISMA hyperspectral sensor (30m) with the additional panchromatic band (5m) has opened a new possibility for effective and efficient seagrass species mapping in comparison with airborne hyperspectral imaging. Therefore, it is necessary to assess the accuracy of pan-sharpened PRISMA hyperspectral image to map seagrass species composition mapping in the optically shallow tropical water. Karimunjawa Islands, Indonesia was selected as our study area. The PRISMA hyperspectral image was obtained at level 2C, at-surface reflectance geocoded level. Smoothing Filter-based Intensity Modulation pan-sharpening algorithm was used to pan-sharpen the 30m hyperspectral bands into 5m spatial resolution. Linear Spectral Mixture Analysis was conducted to obtain the composition of seagrass species and other benthic covers from the pan-sharpened image pixels, based on the pure endmembers of six tropical seagrass species, bare substrates, and macroalgae. Random Forest (RF) classification was conducted using the denoised and sunglint corrected pan-sharpened image and the fractional abundance image at species level as input. Field seagrass species data used for the accuracy assessment reference was collected using photoquadrat and phototransect technique. Our results indicated that seagrass species mapping using pan-sharpened PRISMA hyperspectral image in patchy and with low to medium coverage is not effective and especially if only using spectra based algorithm such as LSMA for due to the similarity of spectral response between seagrass species. However, the RF classification results with both inputs show a very similar spatial distribution, although deglint image produce better maps in terms of their accuracy.

Keywords: PRISMA, Hyperspectral, Pan-Sharpened, Seagrass, Species, Mapping, Accuracy Assessment.